

A Summary of the Differences Between the Release and Beta Versions of X-12-ARIMA.

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This document gives a brief summary of the new features in the current Release version of the X-12-ARIMA program that were not in the Beta version of X-12-ARIMA.

Features new to this release of X-12-ARIMA are briefly described in Part 1, while changes in argument names and command names from the Beta version of X-12-ARIMA are described in Part 2. In each of these sections, a sample set of commands is given showing how the new or revised feature is invoked.

A summary of features and arguments of the Beta version of X-12-ARIMA that are not in the Final version of X-12-ARIMA is given in Part 3.

A few examples of complete X-12-ARIMA input specification files are presented in Part 4. Each example is accompanied by a brief description of the options being used in the input file.

Appendixes I-IV at the end of the document show tables that have been added, renamed, moved, or removed from the program, as well as contact information for the release version of X-12-ARIMA.

The reader is referred to Sections 2.7 and 6 of the X-12-ARIMA Reference Manual for more detailed information about the new and changed features. Section 6 contains documentation for the individual input commands of X-12-ARIMA (which are referred to as "specs" in the remainder of this document). The version of the X-12-ARIMA Quick Reference for your computing platform will have information on how to run X-12-ARIMA on your system as well as some details about the arguments and tables listed here.

Part 1: Descriptions of new features

General Options

An option to save modeling and seasonal adjustment diagnostics into a log file. This option is available in the composite, transform, x11, automdl, estimate, slidingspans, and history specs. It is particularly suited for use with a metafile to obtain compact diagnostic output for a run with many series or for a run exploring a variety of adjustment options for a single series.

```
x11{  
    savelog = ( m7 q )  
}
```

If a metafile (or data metafile) is used for the run, this log file has the same filename as the metafile. It has the same filename as the main output file if a single input specification file is run. The file extension is .log

Using the new -g flag, a directory can be specified on the command line where tables from the X-12-ARIMA run will be stored for use with X-12-GRAPH, a SAS/GRAPH module developed to produce graphical output from X-12-ARIMA runs.

```
x12a ustot -g c:\x12a\graphics
```

Data Transformation and Prior Adjustment

An AIC-based automatic transformation selection procedure is available to choose between a log and no transformation.

```
transform{  
    function = auto  
}
```

If the choice is no transformation and the specfile contains the **x11** spec, then an additive seasonal adjustment decomposition will result.

A leap-year prior adjustment can be specified through the adjust argument.

```
transform{  
    adjust = lpyear  
}
```

Users can specify whether the factors in a set of prior adjustment factors are permanent adjustment factors (where the prior effect is removed from the seasonally adjusted series) or temporary adjustment factors (where the prior effect remains in the seasonally adjusted series).

```
transform{
  file = "tmpprior.dat"
  type = temporary
}
```

Seasonal Adjustment

A regression procedure has been implemented for simultaneously estimating trading day, holiday, and user-defined regression effects from the irregular component of a seasonal adjustment.

```
x11regression{
  variables = ( td easter[8] )
  user = ( strike )
  file = "strike.dat"
  usertype = holiday
}
```

An alternate method of robustifying this regression is provided by identifying AO outliers, rather than eliminating irregulars identified as extreme when months are grouped by trading day type. This method should be used whenever a holiday regressor is specified, or a user-defined regressor for an effect other than trading day.

```
x11regression{
  variables = ( td easter[8] )
  critical = 3.5
  outliermethod = addone
}
```

An AIC-based test can be specified to check if trading day, Easter, or user-defined regressors are significant.

```
x11regression{
  variables = easter[8]
  user = ( strike90 strike95 )
  file = "strike.dat"
  aictest = ( td user )
}
```

An argument (*keepeaster*) has been added to allow users to specify whether holiday effects (estimated via a regARIMA model, irregular regression, or the Bateman-Mayes technique) remain in the final seasonally adjusted series. The default for this option is to remove these effects, which is a change from the Beta version of the program.

```
x11{
  x11easter = yes
  keepeaster = yes
}
```

A 3-term seasonal moving average is now available.

```
x11{
  seasonalma = s3x1
}
```

A table of month-to-month (or quarter-to-quarter) changes in the final trend component is now available.

```
x11{
  print = trendchanges
}
```

Seasonal Adjustment Diagnostics

A historical analysis of revisions at various lags can be specified for the seasonally adjusted series, final trend component, and the month-to-month (or quarter-to-quarter) changes of these quantities. Up to 5 revisions lags can be specified. The lags must be greater than zero.

```
history{
  estimates = (sadj trend)
  sadjlags = (1 2 3 12 24)
  trendlags = (1 2 3 5)
}
```

The target to which the lagged estimates are compared to define the revisions can be set to be either the concurrent or the final estimate.

```
history{
  estimates = sadj
  sadjlags = (1 2 3 12 24)
  target = concurrent
}
```

Summary tables for the revisions history analysis can be organized either by the year or the calendar period (month or quarter) of the data.

```
history{
  estimates = sadj
  sadjlags = (1 2 3 12 24)
  printby = year
}
```

Modeling options

New built-in regressors for temporary change outliers, a single coefficient trading day model, and an Easter effect developed by Statistics Canada are available.

```
regression{
  variables = ( tc1987.jan td1coef sceaster[8] )
}
```

The last two types of regressors are also available in the *x11* regression spec.

```
x11regression{
  variables = ( td1coef sceaster[8] )
  critical = 3.5
}
```

Automatic model-based identification of temporary change outliers are now done in addition to point outliers (AO's) and level-shift outliers (LS's).

```
outlier{ types = all }
```

The rate of decay for the temporary change outliers can be set for all temporary change outliers specified in the regression spec.

```
regression{
  variables = ( td tc1989.jul )
  tcrate = 0.5
}
```

This rate of decay can be changed in the automatic outlier identification procedure as well.

```
outlier{
  types = (ao tc)
  tcrate = 0.5
}
```

Users can specify partial change-of-regime regression variables for many of the built-in regression variables in X-12-ARIMA. With one type of partial change-of-regime, X-12-ARIMA estimates a set of regressors that are defined as usual before the date of the change of regime, and are set to zero for those observations on or after the change of regime date.

```
regression{
  variables=( seasonal/1982.1// LS1982.1 )
}
```

Another type of partial change-of-regime inserts a regressor that is defined as usual on or after the date of the change of regime, and is set to zero for the time prior to the change of regime date.

```
regression{
  variables=( seasonal//1982.1/ LS1982.1 )
}
```

Automatic AIC-based test to test the significance of the set of user defined regressors as well as trading day and/or Easter holiday effects. If the set of user-defined variables is found to have statistical significance, estimated effects are calculated for all the regressors in the set.

```
regression{
  user = (strike90 strike95)
  file = "strike.dat"
  aictest = ( td easter user )
}
```

Part 2: Descriptions of Revised Features or Arguments

General Options

The "edit-date" format used in the *series*, *transform*, *regression* and *x11regression* specs (*format="edit"*) has been renamed the "datevalue" format.

```
series{
  period = 12
  file = "series.dat"
  format = "datevalue"
}
```

The *startspectrum* argument used in the *series* and *composite* specs has been renamed *spectrumstart*.

```
series{
  file = "sales.dat"
  start = 1980.jan
  spectrumstart = 1985.jan
}
```

Seasonal adjustment options

Options associated with X-11 trading day estimation and adjustment have been moved from the *x11* spec to the *x11regression* spec, but some are invoked differently. The *tdexclude* argument has been renamed *sigma*, and the *tdstart* argument has been renamed *start*.

```
x11regression{
  variables = (easter[15])
  sigma = 3.0
  start = 1982.jan
  tdprior = (1.4 1.4 1.4 1.4 1.4 0.0 0.0)
}
```

The *tdapply* argument no longer exists, but a partial change of regime trading day regressor can be used to get the same results.

```
x11regression{
  variables = (td//1985.jan/)
}
```

The Bateman-Mayes Thanksgiving and Labor Day holiday adjustment options invoked by the *x11holiday* argument have been removed. (They have been replaced by alternative procedures invoked via the *x11regression* spec). The Bateman-Mayes Easter adjustment option is still available.

```
x11{
  x11easter = yes
}
```

The possible values of the *itrendma* argument have been renamed from 1 and 2 to *centered1yr* and *cholette2yr*, respectively

```
x11{
  itrendma = cholette2yr
}
```

Options associated with the *final* argument of the *x11* spec now refer to model based factors for AO and LS outliers and user-defined regression variables. These factors can be removed from the final seasonally adjusted series via the *final* argument.

```
x11{
  final = ( ao ls user )
}
```

Seasonal Adjustment Diagnostics

Options associated with the *estimates* argument of the history spec have been renamed: *sf* is now *seasonal*, *chng* is now *sadjchng*, and *trendch* is now *trendchng*.

```
history{
  estimates = (sadj sadjchng trend trendchng)
}
```

Revisions history analyses for the concurrent and projected seasonal factors are now both invoked by the *seasonal* option of the *estimates* argument.

```
history{
  estimates = seasonal
}
```


Modeling OptionsModeling OptionsModeling Options

Estimated effects from the trading day, holiday, outlier and user-defined regressors specified in the regression spec will be removed from the series before seasonal adjustment unless the *noapply* option of the regression spec is used to declare that certain types of regressors are not to be removed. Previously, users had to declare which regression effects they wanted removed from the series using the *prior* argument of the *regadjust* spec. (There is no longer a *regadjust* spec.)

```
regression{
  variables = ( seasonal ao1970.dec ls1975.mar )
  noapply = ( ao ls )
}
```

Several other options and tables from the *regadjust* spec have been transferred to the *regression* spec. The *userreg* option has been renamed *usertype*.

```
regression{
  variables = ( seasonal lom )
  user = ( newtd1 newtd2 newtd3 newtd4 newtd5 newtd6 )
  file = "newtd.dat"
  usertype = td
  augmentusertd = yes
  print = td
  save = td
}
```

The test for overdifferencing for the seasonal MA parameter ("seasonal overdifferencing") is no longer used to eliminate a model from consideration in the automatic model selection procedure. If seasonal overdifferencing is detected, a warning message is printed.

```
automdl{
  overdiff = 0.95
}
```

The *td6* option of the *variables* and *aictest* arguments of the *regression* spec has been renamed *tdnolpyear*.

```
regression{
  variables = ( seasonal tdnolpyear lom )
  aictest = tdnolpyear
}
```

The *easter* option of the *aictest* argument in *regression* and *x11regression* will now do a simple test between no Easter effect and any set of user specified Easter regressors specified in the *variables* argument of either spec. If no Easter regressor is given, the *aictest* argument will test a suite of Easter regressors, as before.

```
regression{
  variables = ( seasonal easter[5] )
  aictest = easter
}
```

Part 3 : Options Removed from X-12-ARIMA

The *regadjust* spec has been removed from X-12-ARIMA; see the previous section for information on options in the *regression* spec that replace the *regadjust* spec.

The table below gives arguments that are no longer available in the release version of X-12-ARIMA.

Argument deleted	Spec in Beta X-12-ARIMA
apply	transform
td	x11
lom	x11
tdmaxlead	x11
extremeadj	x11
revisionlag	history
adjfcst	history

Part 4. Example Input Specification Files

Four examples are given below of complete input specification files, with an explanation of the options used for each file. An example of the use of a metafile to run a number of input files in succession is also given.

Example 1:

Perform an X-11 seasonal adjustment with a 3x9 seasonal filter and a 23-term Henderson trend filter. Set the lower and upper sigma limits for determining extreme values to 1.8 and 2.8, respectively. Also perform a trading day regression on a preliminary irregular component and adjust with the resulting factors. Note that no regARIMA modeling is done in this run.

```
series{
  start = 1979.jan
  file = "usopec.dat"
  title = "U. S. Exports to Oil Producing Nations"
}
x11{
  seasonalma = s3x9
  trendma = 23
  sigmalim = (1.8 2.8)
}
x11regression{
  variables = td
}
```

Example 2:

Determine whether the log transformation is better than no transformation for modeling this series using AIC. The ARIMA model below will be used in the test procedure.

```
series{
  start=1979.jan
  file="usopec.dat"
  title="U. S. Exports to Oil Producing Nations"
}
transform{
  function=auto
}
arima{
  model = (0 1 2)(0 1 1)
}
```

Example 3:

Preadjust the series for a set of inflation deflators, and keep the effect of the deflators in the seasonally adjusted series to obtain a seasonally adjusted deflated series. Use the automatic model selection and automatic outlier selection procedures to generate a RegARIMA model. Include trading day regression variables in this model. Preadjust the original series for trading day and Easter effects, point outliers, temporary changes and level-shift outliers before seasonally adjusting the series (if Easter effects are significant according to the AIC test and outliers are identified), and extend this series with 24 forecasts generated from the RegARIMA model selected. Perform an X-11 seasonal adjustment using the default options.

```
series{
  start=1979.jan
  file="usopec.dat"
  title="U. S. Exports to Oil Producing Nations"
}
transform{
  function=log
  file = "infinindex.dat"
  type = temporary
}
regression{
  variables=td
  aictest=(td easter)
}
automdl{
  mode=fcst
}
outlier{
  type = all
  critical=3.00
  print=all
}
estimate{ }
forecast{
  maxlead=24
}
x11{ }
```

Example 4:

Fit a regARIMA model, whose MA(2) coefficient is kept fixed at 0, with mean function regressors for a constant term, trading day, temporary change and point outlier variables and a user-defined variable for the Ramadan holiday effect. Save the ACF and PACF from the model. Prior to seasonal adjustment, adjust the original series for trading day, outlier and user-defined regression effects, and append 24 forecasts to the series.

Seasonally adjust the series, allowing the program to choose an appropriate seasonal filter, but fixing the length of the Henderson trend filter at 17. Print out all standard seasonal adjustment diagnostics and plots. Perform a sliding spans analysis, keeping the model parameters fixed for each span at the values obtained from the full data set.

```
series{
  start=1979.jan
  file="usopec.dat"
  title="U. S. Exports to Oil Producing Nations"
}
transform{
  function=log
}
regression{
  variables=(const td AO1991.oct TC1989.mar)
  user=ramadan
  file="ramadan.txt"
  usertype = holiday
}
arima{
  model=(0 1 [1 3])(0 1 1)
}
estimate{ }
check{ save=(acf pacf) }
forecast{
  maxlead=24
}
x11{
  seasonalma=msr
  trendma=17
}
slidingspans{ fixmdl=yes }
```

Example 5:

Assume Examples 1-4 above are stored in files as follows: Example 1 is stored in *c:\usopec\example1.spc*, Example 2 is stored in *c:\usopec\example2.spc*, etc. A metafile that would run all four examples would look like this:

```
c:\usopec\example1  
c:\usopec\example2  
c:\usopec\example3  
c:\usopec\example4
```

If the metafile is named *c:\usopec\example5.mta*, it would be run by entering

```
x12a -m c:\usopec\example5
```

and pressing Enter.

Appendix I : New X-12-ARIMA tables

Table name	Spec	Description
outlieradjcomposite	composite	composite series adjusted for regARIMA outliers
indtrendchanges	composite	month-to-month (or quarter-to-quarter) changes in the final trend component of the indirect seasonal adjustment
tempprior	transform	temporary prior adjustment factors
permprior	transform	permanent prior adjustment factors
combholiday	x11	combined holiday prior adjustment factors
trendchanges	x11	month-to-month (or quarter-to-quarter) changes in the final trend component
seasonaladjregsea	x11	seasonally adjusted series adjusted for regARIMA user-defined seasonal
holidayb	x11regression	holiday factors derived from irregular regression, b iteration
calendarb	x11regression	trading day and holiday factors derived from irregular regression, b iteration
combcalendarb	x11regression	holiday and combined trading day factors derived from irregular regression, b iteration
holiday	x11regression	holiday factors derived from irregular regression
calendar	x11regression	trading day and holiday factors derived from irregular regression
combcalendar	x11regression	holiday and combined trading day factors derived from irregular regression
xaictest	x11regression	results of aic tests for trading day, easter, and user-defined regressors for irregular regression
xregressionmatrix	x11regression	regression matrix for irregular regression
outlierhdr	x11regression	header for ao outlier identification, irregular regression
outlieriter	x11regression	iterations for ao outlier identification, irregular regression
outliertests	x11regression	test statistics for ao outlier identification, irregular regression
regseasonal	regression	regARIMA user-defined seasonal
aictest	regression	results of aic tests for trading day, easter, and user-defined regressors
yypercent	slidingspans	the percent of observations flagged as unstable for the year-to-year changes of the final seasonally adjusted series
indypercent	slidingspans	the percent of observations flagged as unstable for the year-to-year changes of the final indirect seasonally adjusted series

Appendix I : New X-12-ARIMA tables (Continued)

Table name	Spec	Description
yysummary	slidingspans	tables, histograms and hinge values summarizing the percentage of observations flagged for the year-to-year changes of the final seasonally adjusted series
indyysummary	slidingspans	tables, histograms and hinge values summarizing the percentage of observations flagged for the year-to-year changes of the final indirect seasonally adjusted series
sasummary	history	summary statistics for revisions history of seasonally adjusted series
indsasummary	history	summary statistics for revisions history of the indirect seasonally adjusted series
chnghsummary	history	summary statistics for revisions history of the change in the seasonally adjusted series
trendsummary	history	summary statistics for revisions history of final trend component
trendchnghsummary	history	summary statistics for revisions history of the change in the final trend component
sfsunmary	history	summary statistics for revisions history of the concurrent and projected seasonal factors

Appendix II - Renamed X-12-ARIMA tables

Old table name	New Table Name	Spec
specori	specorig	series
orivindadjplot	origwindsaplot	composite
indchangeori	origchanges	composite
indchangesa	indsachanges	composite
indchangeadjsa	indrevsachanges	composite
indchangesarnd	indrndsachanges	composite
indtrendadjext	indtrendextrmod	composite
ratioindsrsplot	ratioplorig	composite
ratioindsaplot	ratioplotsa	composite
priorfactors	prior	transform
x11holiday	x11easter	x11
adjoriplot	adjorigplot	x11
sadjb6	seasadjb6	x11
sadjb11	seasadjb11	x11
tdadjorib	tdadjorigb	x11

Appendix II - Renamed X-12-ARIMA tables (continued)

Old table name	New Table Name	Spec
sadjc6	seasadjc6	x11
sadjc11	seasadjc11	x11
tdadjori	tdadjorig	x11
sadjd6	seasadjd6	x11
adsatot	seasadjtot	x11
sadjround	saround	x11
modsadj	modseasadj	x11
changeori	origchanges	x11
changesa	sachanges	x11
changeadjsa	revsachanges	x11
changesarnd	rndsachanges	x11
trendadjext	trendextmod	x11
ratiosrsplot	ratioplotorig	x11
ratiosaplot	ratioplotsa	x11
autoheader	header	automdl
chrevisions	chngrevisions	history
chestimates	chngestimates	history
trendchrevisions	trendchngrevisions	history
trendchestimates	trendchngestimates	history
ssheader	header	slidingspans
range	factormeans	slidingspans
sfspan	sfspans	slidingspans
chspan	chnspans	slidingspans
saspan	saspan	slidingspans
ycspan	ychngspans	slidingspans
tdspan	tdspans	slidingspans
rangeind	indfactormeans	slidingspans
percentind	indprecent	slidingspans
sfspanind	indsfspans	slidingspans
chspanind	indchnspans	slidingspans
saspanind	indsaspan	slidingspans
ycspanind	indychngspans	slidingspans

Appendix III - Moved X-12-ARIMA Tables

Old table name	Old spec	New table name	New spec
priortd	x11	priortd	x11regression
extremetdb	x11	extremevalb	x11regression
tdregb15	x11	x11regb	x11regression
tdfacb	x11	tradingdayb	x11regression
combtodb	x11	combtradingdayb	x11regression
extremetd	x11	extremeval	x11regression
tdreg	x11	x11reg	x11regression
tdfac	x11	tradingday	x11regression
combtod	x11	combtradingday	x11regression
aoutlier	regadjust	aoutlier	regression
levelshift	regadjust	levelshift	regression
tradingday	regadjust	tradingday	regression
holiday	regadjust	holiday	regression
userdef	regadjust	userdef	regression
outlieradjori	regadjust	outlieradjorig	series

Appendix IV - Deleted X-12-ARIMA tables

Table name	SpecSpec
ftesthol	x11
aictd	regression
aiceaster	regression
projsfrevisions	history
projsfestimates	history

Addendum : For More Information

For more information on those features that have already been implemented, please consult the X-12-ARIMA Reference Manual first. If a copy is not available or you have other questions or concerns, you can contact David F. Findley or Brian C. Monsell at any of the following:

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